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On two sibling *Lathys* species (Araneae, Dictynidae) from northern Europe

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Abstract

New diagnoses for the morphologically closely related species *Lathys humilis* (Blackwall, 1855) and *L. nielseni* (Schenkel, 1932) are provided. These species are most easily distinguished from one another by their abdominal patterns. Detailed illustrations are provided, and the distribution limits and habitat preferences of both species are discussed. Previous records of *L. humilis* from Finland refer to *L. nielseni*. The taxonomy of the genus *Lathys* is also briefly discussed.

Keywords

Lathys humilis, *Lathys nielseni*, spiders, taxonomy, distribution, habitats

Introduction

Lathys is a relatively large genus of dictynid spiders with 38 species known exclusively from the Holarctic (Platnick 2009). This genus has not been revised on a large scale. Our recent studies on the morphology of the male palp (Marusik et al. 2006) revealed that members of *Lathys* have a highly complex palpal structure with several features unique for the family and even for the order. Three species of *Lathys* are known to occur in northern Europe: *L. humilis* (Blackwall, 1855), *L. nielseni* (Schenkel, 1932)

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and *L. stigmatisata* (Menge, 1869) (Roberts 1995; Almquist 2006). Only the first two species are known from Fennoscandia (Norway, Sweden and Finland). For more than a decade following Lehtinen's (1967) revision, *L. nielseni* was considered a synonym of *L. humilis*. The former species, which was described from Öland Island, Sweden, was removed from synonymy by Thaler (1981) who could show distinct differences in the morphology of the male palp and more prominent differences in the shape of the female epigyne.

A recent survey of the Swedish fauna revealed that two closely related species, *L. humilis* and *L. nielseni*, occur in the southeastern region of the country (Almquist 2006). Finnish check-lists of spiders (Palmgren 1977; Koponen 2008) mention only *L. humilis*. During our studies of Palaearctic *Lathys* we realized that specimens of *L. humilis* from Finland differ greatly in their abdominal patterns from specimens of the same species from Crimea, Azerbaijan and Iran. The Finnish specimens of *L. humilis* that we studied, stored in the collections of the Zoological Museums of the University of Turku and the University of Helsinki, actually belong to *L. nielseni*. Although the male palps in these two species are very similar, the epigynes are quite different, and both species can be easily distinguished by their abdominal patterns. The specific abdominal coloration is distinct even in juveniles. The differences in patterns were illustrated by Almquist (2006), but the importance of such differences was not commented on or even mentioned.

The goal of this study is to provide detailed diagnoses for both species and to trace the distribution range of these two sibling *Lathys* species.

Materials and methods

Specimens were photographed using an Olympus Camedia C-5050 camera attached to an Olympus SZX12 stereomicroscope. The images were processed using "CombineZM" image stacking software. SEM-microphotographs were taken with a JEOL JSM-5200 in the Zoological Museum, University of Turku. Scales in some figures are missing because of the lack of special equipment and/or computer programs. All measurements are given in millimetres.

Acronyms:

ZMH Zoological Museum, Finnish Museum of Natural History, University of Helsinki

ZMMU Zoological Museum, Moscow Lomonosov State University

ZMT Zoological Museum, University of Turku.

Abbreviation used for the copulatory organs: *Ca* – apical portion of conductor; *Ct* – tip of conductor; *Co* – copulatory opening; *Da* – dorsal tibial apophysis; *Fm* – margin of the epigynal fovea; *Ia* – intermediate tibial apophysis; *Pa* – patellar apophysis; *Se* – septum; *Va* – ventral tibial apophysis.

Taxonomy

Lathys Simon, 1884

Lethia Menge, 1869: 249.
Lathys Simon, 1884: 321, *nomen novum* pro *Lethia* Menge, 1869 preoccupied by *Lethia* Hübner, 1816 in Lepidoptera.

Type species: *Lethia varia* Menge, 1869 from Prussia. It is considered a junior synonym of *Ciniflo humilis* Blackwall, 1855 (= *Lathys h.*, from England). The type specimens of *L. varia* seem to be lost. It is unclear as to whether *L. varia* and *L. humilis* are synonyms. *L. varia* may also be a senior synonym of *L. nielseni* (Schenkel, 1932), the coloration and habitat data of Menge (1869) may refer to both species.

Lathys humilis is considered by several arachnologists, for example Lehtinen (1967), Thaler (1981) and Platnick (2009), to be the type species of the genus. However, Gertsch (1946) and Chamberlin and Gertsch (1958) clearly indicated that *Lethia varia* was the generotype, even though it is a junior synonym of *L. humilis.*

Lehtinen (1967) seems to have been the first to split *Lathys* into eight species groups. The third group was named *humilis.* Lehtinen (1967) included three species in this group: *L. alticola* (Denis, 1954); *L. brevitibialis* Denis, 1956 (still known from males only) and *L. sexpustulata* (Simon, 1878) and seems to have forgotten to include *L. humilis* in the list. It is not clear whether all three species belong to this group. One subspecies, *L. humilis meridionalis* (Simon, 1874), known from Spain, France, Corsica and North Africa (Platnick 2009) is not mentioned by Lehtinen (1967). Its status remains unclear, because it has not been studied by taxonomists in recent years. All three taxonomic entries for this species belong to Simon (Platnick 2009). Following the removal of *L. nielseni* and *L. annulata* Bösenberg & Strand, 1906 from synonymy with *L. humilis* (Thaler 1981; Ono 2003), and the recent synonymisation of *L. alticola* with *L. sexpustulata* (Ledoux et al. 2008) the *L. humilis*-group now includes five species and one subspecies. Only three of these (*L. humilis, L. annulata* and *L. nielseni*) have been properly studied and undoubtedly belong to the *humilis* group.

The detailed morphology of the male palp in *Lathys* in general, and in its type species in particular, was unknown for a long time. There was no detailed written or illustrated description of the palpal tibia and bulbus. Thaler (1981) was the first to indicate and illustrate three tibial apophyses in *Lathys humilis* and *L. nielseni*. The structure of the bulbus in the *Lathys stigmatisata*-group was first studied by Marusik et al. (2006). They found that members of this group had a unique modification of the conductor, consisting of a very long upper part forming several coils over one another, a very long embolus, and a totally fixed terminal part of the conductor by the tibial apophyses and cymbium [cf. Marusik et al. (2006)]. The present study revealed that *L. humilis* and *L. nielseni* have the same conformation of the bulbus in general and the conductor in particular. As a result of this and previous studies it became possible to provide a new, revised diagnosis for the genus.

Lathys can be easily distinguished from other dictynids by the presence of three tibial apophyses, the long and coiled upper arm of the conductor, which totally covers the tegulum, and a screw-like terminal part of the conductor arrested by the tibial apophyses and the cymbium (Figs 13, 15-17, 19).

Females of *Lathys* cannot be diagnosed so easily. In all *Lathys* species studied by us (*L. stigmatisata-* and *L. humilis*-groups) the insemination ducts make a kind of loop or coil around the copulatory opening (cf. Figs 27, 30 and fig. 229b in Wiehle 1953). In addition, the epigynal fovea or the pair of copulatory openings are larger than or equal to the spermatheca or in some cases about two times smaller. The related genus *Scotolathys* Simon, 1884 has no loops (or coils) around the copulatory duct, and its spermatheca is much larger than its fovea (cf. Marusik et al. 2009).

***Lathys humilis* (Blackwall, 1855)**
Figs 1-3, 7-9, 13-16, 20-22, 26-27

L. h.: Wiehle 1953: 102, f. 222-227 (♂♀).
L. h.: Thaler 1981: 127, f. 77-79, 85-86 (♂♀).
L. h.: Almquist 2006: 319, f. 280a-h (♂♀).
For other references, see Platnick (2009). Some of them may refer to *L. nielseni* or other species.

Misidentifications:
L. h.: Schenkel 1936: 14, f. 1a-b (♀). May refer to undescribed species.
L. h.: Lehtinen 1967: 242, f. 264 (♂). Refers to *L. nielseni.*
L. h.: Palmgren 1977: 22, f. 4.20-24 (♂♀). Refers to *L. nielseni.*
L. h.: Paik 1978: 185, f. 75.1-5 (♀). Seems to refer to *L. maculosa* (Karsch, 1879).
L. h.: Hu 1984: 60, f. 55. 1-2 (♀). Refers to *L. nielseni.*
L. h.: Zhu 1985: 58, f. 48a-c (♂). May refer to *L. nielseni* or to *L. annulata.*
L. h.: Song et al. 1999: 364, f. 215N (♂). May refer to *L. nielseni* or to *L. annulata.*
L. h.: Song et al. 2001: 287, f. 181A-B (♂). May refer to *L. nielseni* or to *L. annulata.*

Material examined. DENMARK: 1♀ (ZMT: AA 11.130), Bornholm Isl., Ibsker, Paradisbakkerne Grydedal, in small sphagnum beds around a small pond, 30.06.1967 (P.T. Lehtinen). BULGARIA: 1♀ (ZMMU), Blagoevgrad Distr., Rila Mt. range, ESE slope of Karpatnik Mt., Bodovitsa River Valley, right riverside, ca 3.8 km WNW of Bachevo, *Pinus–Fagus* forest, 41°56'12"N, 23°24'09"E, 1230 m, 10.08.2005 (A. Gromov). UKRAINE: 35♂♀ (ZMUT, ZMMU) **Crimea**, Simferopol Distr., Chatyr-Dagh Mt., 23.04.2000 (D.S. Letova); Feodosya Distr., Karadag Nature Reserve, Kara-Agach Mt., *Juniperus excelsa,* sweeping, 14-16.05.2008 (A.A. Nadolny); Yalta Distr., Martyan Cape Reserve, 30.04.-13.05.2007 (M.M. Kovblyuk); 1♂ (ZMMU), **Ternopil'** Area, environs of Dzvynyach Village, old nest of *Sylvia atricapilla*, on bush 0.9 m above the ground, 5.05.2006 (M. Fedo-

ryak). AZERBAIJAN: 2♂ 31♀ (ZMMU), SE Azerbaijan, Lenkoran Dist., environs of Aurora Village, 38°40'N 48°52'E, 23-28.04.2001 (Yu.M. Marusik); 1♂ (ZMMU) same locality and collector, 21-29.05.2003; 2♀ (ZMMU), SE Azerbaijan, Lenkoran Distr., Hyrcan Reserve, environs of Apo Village, 38°38'N 48°47'E, 28.05.2003 (Yu.M. Marusik); 1♂ (ZMMU), SE Azerbaijan, ca 10 km W of Astara Village, Isti-Su, 38°27'N 48°47'E, 25.04.2001 (Yu.M. Marusik). IRAN: 2♀ (ZMMU), Mazandaran Prov., Nashtarood-Khoshkadaran, 51.033°E 36.750°N, 9-10.06.2000 (Yu.M. Marusik).

Description. Measurements (Crimean specimens). **Male**. Total length 1.7; carapace 0.9 long, 0.7 wide, 0.4 high; chelicerae 0.5 long. Variation (n=2): total length 1.6-1.7; carapace 0.8-0.9 long, 0.6-0.7 wide; 0.4 high.

Length of leg segments:

	femur	**patella**	**tibia**	**metatarsus**	**tarsus**	**total**
I	0.8	0.3	0.7	0.6	0.4	2.8
II	0.6	0.3	0.5	0.5	0.3	2.2
III	0.5	0.2	0.4	0.4	0.2	1.7
IV	0.6	0.2	0.5	0.5	0.2	2.0

Female. Total length 1.9; carapace 0.8 long, 0.6 wide, 0.4 high; chelicerae 0.4 long. Variation (n=3): total length 1.9; carapace 0.8-0.9 long; 0.6 wide, 0.4 high.

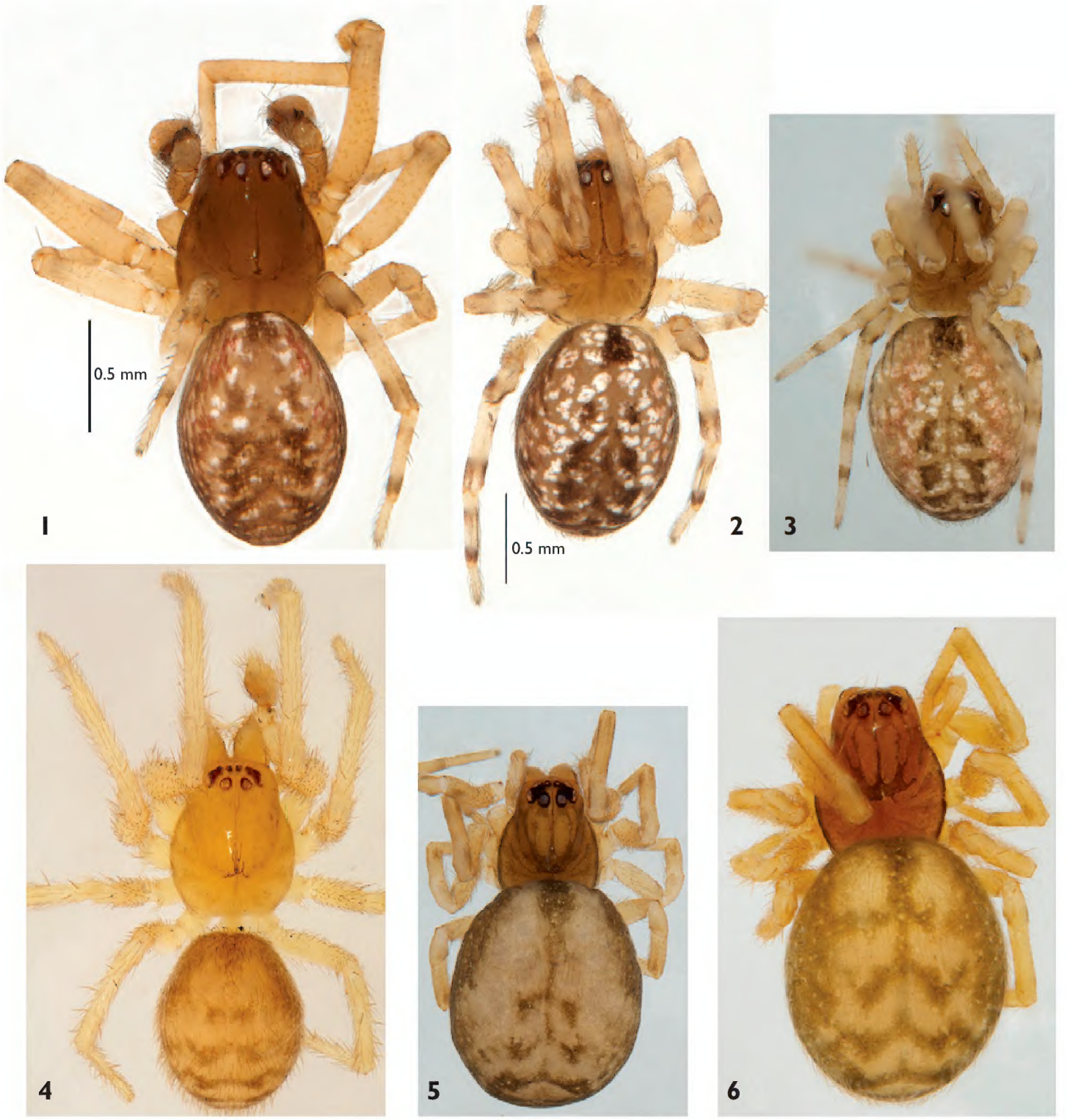
Length of leg segments:

	femur	**patella**	**tibia**	**metatarsus**	**tarsus**	**total**
I	0.7	0.2	0.6	0.5	0.3	2.3
II	0.6	0.2	0.4	0.4	0.2	1.8
III	0.5	0.2	0.3	0.4	0.2	1.6
IV	0.6	0.2	0.4	0.5	0.2	1.9

Colouration. Carapace in both sexes without distinct pattern. Males slightly darker than females. Abdomen with distinct pattern consisting of white guanine dots, black pigment (cardiac mark, sides, and wide posterior band). Legs with distinct annulations.

Copulatory organs. Male palp (Figs 7-9, 13-16) with patellar apophysis, tibia with three apophyses (retrolateral dorsal, retroventral and retrolateral (or intermediate) that fix (lock) terminal part of conductor. Conductor very long with two arms. Upper arm coiled, and terminal part spine-like and slightly twisted. Epigyne as in Figs 20, 26-27 with one shallow fovea, and copulatory openings placed in apical-lateral part of fovea. Receptacula droplet-shaped. Insemination ducts short and forming one turn.

Diagnosis. *Lathys humilis* can be easily distinguished from the closely related *L. nielseni* by the abdominal pattern consisting of dark stripes and white spots formed from guanine deposits (Figs 1-3). White guanine deposits are totally absent in *L. nielseni* (Figs 4-6). The two species can also be separated on the basis of the copulatory organs. The epigyne of *L. humilis* has shorter insemination ducts turned upwards in



Figures 1-6. Habitus and pattern of *Lathys humilis* (**1-3**) and *L. nielseni* (**4-6**) **1**, **4** male, dorsal **2-3**, **5-6** female, dorsal **1-2** from Crimea **3** from Azerbaijan **4-5** from Finland **6** from Ural.

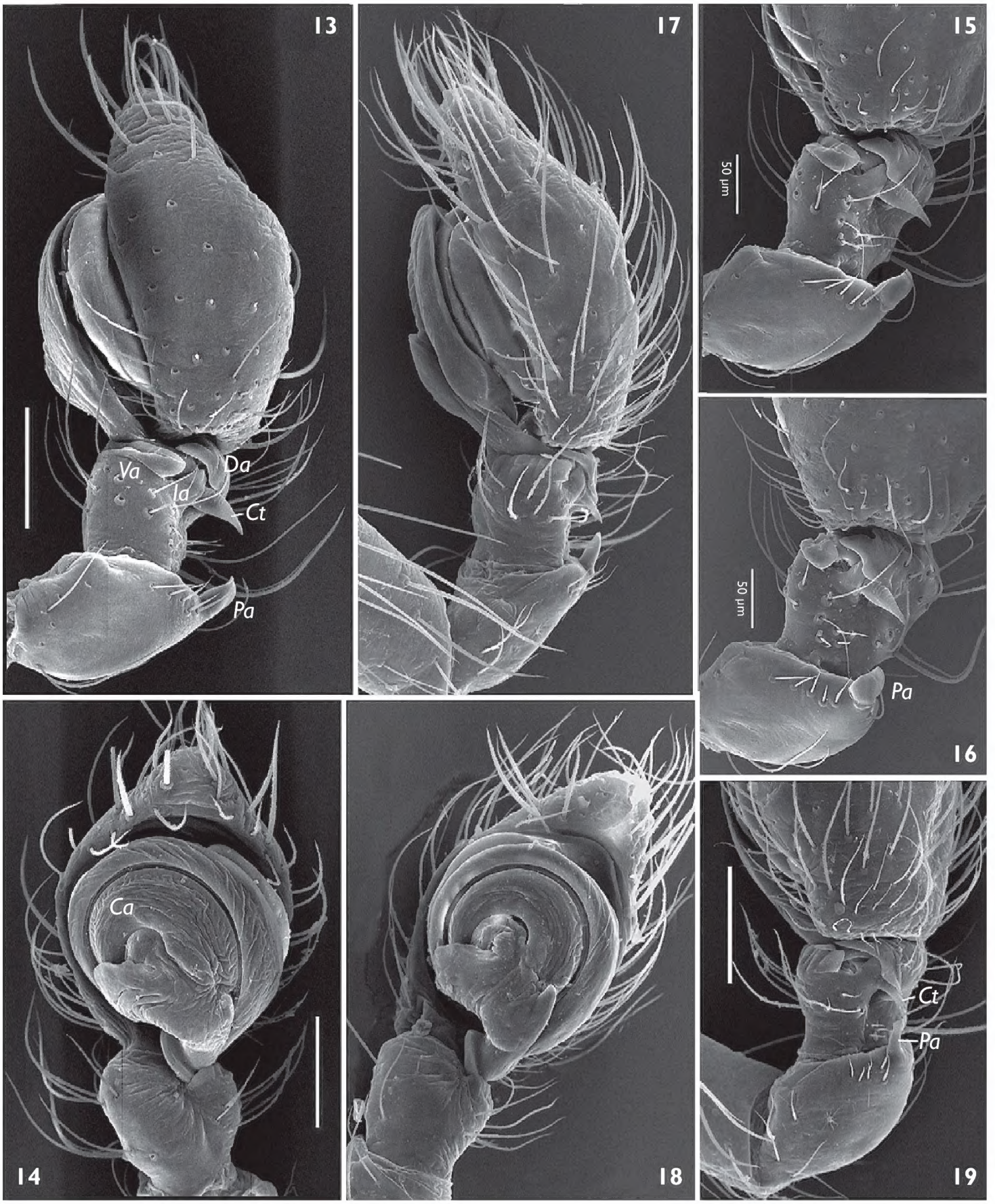
the place where they are attached to the spermathecae. The females also differ in the shape of the fovea (cf. Figs 20, 30). In *L. humilis* the epigynal fovea is subdivided by the septum, fovea deep with distinct margins (there is no septum and there are no distinct margins of the fovea in *L. nielseni*). The male palps of the two species are more similar than the epigynes. The two species can be separated by the thicker and broader patellar apophysis in *L. humilis*, the shape of the dorsal tibial apophysis, and the thicker and longer tip of the conductor in *L. humilis.*

L. humilis can be distinguished from the Japanese *L. annulata*, treated for a long time as a junior synonym, by its droplet-shaped spermathecae and its shorter insemination duct forming one loop only (vs. round spermathecae and insemination ducts forming several coils, cf. figs 10-12 in Ono 2003).

Figures 7-12. Male palp of *Lathys humilis* (**7-9**, from Crimea) and *L. nielseni* (**10-12**, from Finland) **7**, **10** ventral **8**, **11** retrolateral **9** bulbus, retrolateral **12** bulbus, dorsal **12** after Marusik et al. (2009).

Distribution. According to the Platnick's (2009) catalogue, this species has a Palaearctic (=trans-Palaearctic) distribution with several records from China (Shandong, Anhui, Shanxi and Gansu), Taiwan and Korea. Judging from the figures of the Chinese specimens, all records of *L. humilis* refer to *L. nielseni* or another species (males of *L. annulata* are unknown). Judging from the figures (cf. Fig. 32) the record of this species from Shandong (Hu 1984) refers to *L. nielseni*. Other records of *L. humilis* from eastern China based on males may also refer to *L. nielseni* or *L. annulata*. The actual species belonging of "*L. humilis*" from Gansu (Schenkel 1936) remains unclear. Figures of the epigyne made by Schenkel are dissimilar to those of *L. humilis* or *L. nielseni*. The specimen stored in the Swedish Museum of Natural History, Stockholm lacks an epigyne and the abdominal pattern is indistinct. The record of this species from

Korea (Paik 1978) refers to *L. maculosa* (Karsch, 1879), which belongs to the *Lathys stigmatisata*-group. According to our studies of the Palaearctic *Lathys*, *L. humilis* seems to be distributed from western Europe to Caucasus and Mazandaran, northern Iran (see "material examined"). The overlapping ranges of *L. humilis* and *L. nielseni* in SW Sweden may be caused partly by misidentifications. Both species were found, however, in samples from Öland in the Swedish Museum of Natural History.



Figures 13-19. Male palp of *Lathys humilis* (**13-16** from Crimea) and *L. nielseni* (**17-19** from Finland) **13**, **17** retrolateral **14**, **18** ventral **15-16**, **19** patella, tibia and base of cymbium, retrolateral-dorsal, different turns **13**, **15** after Marusik et al. (2009). Scale = 0.1 mm if not otherwise indicated.

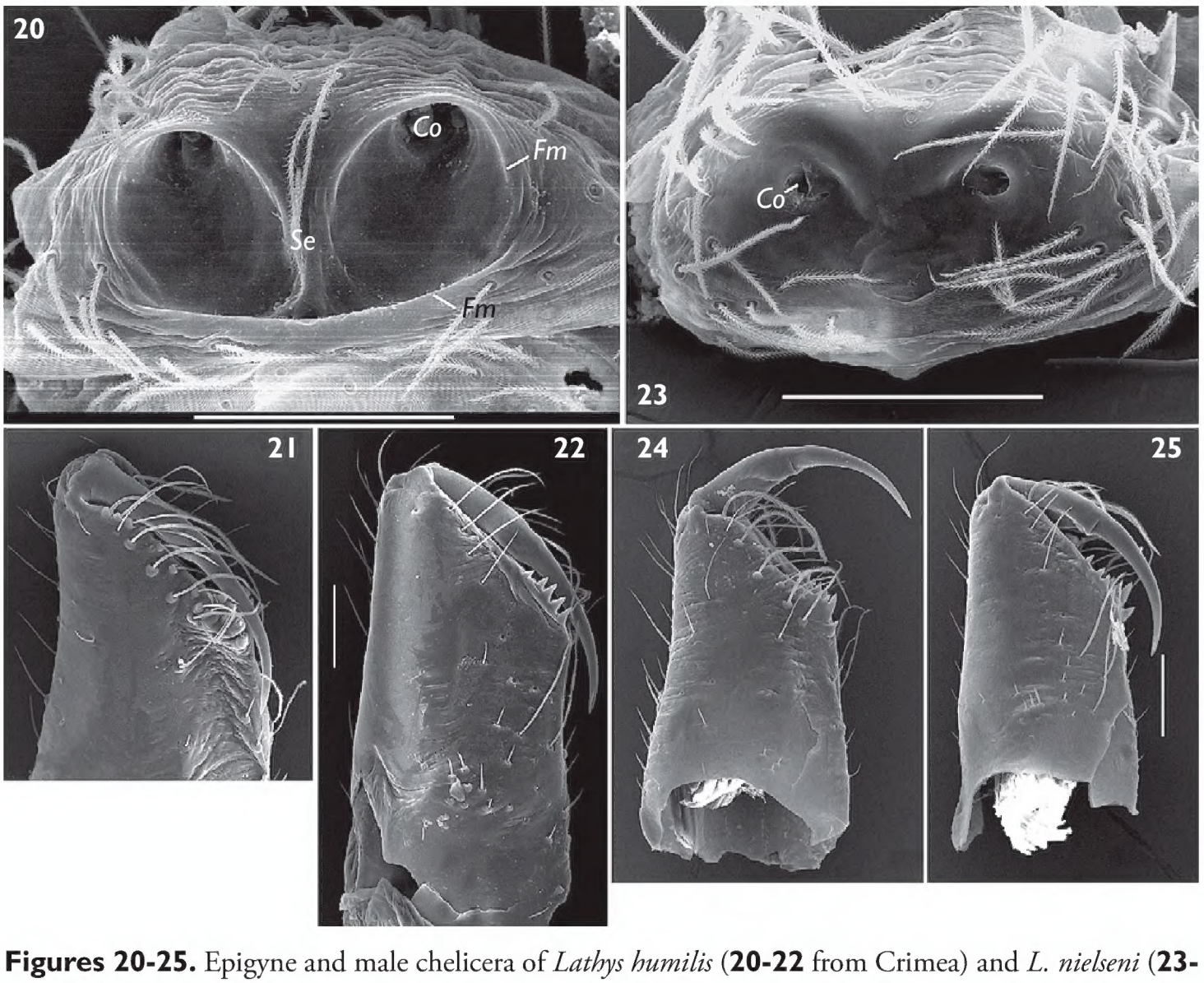
Habitats. According to Hänggi et al. (1995), *L. humilis* is found in Europe especially in coniferous forests (both spruce and pine), on the forests' edges, in field shrubs and hedges, and less frequently in deciduous forests. It has been collected mostly on trees, both in canopies and on stems (Hänggi et al. 1995). According to Roberts (1995), in Great Britain it occurs on bushes and trees with small, hard leaves (heather, gorse, box, yew). Harvey et al. (2002) reported this species from bushes and trees in woodland and scrub, on oak, yew, pines, gorse, etc. It may also be fairly common on ornamental evergreen and privet hedges in parks and gardens; juveniles overwinter in leaf litter, brushwood, under bark and in other similar places (Harvey et al. 2002). In Sweden the species was reported from litter in dry pine forests, from *Calluna*-stands and from litter in woods with oaks and on limestone (Almquist 2006).

Note. Lehtinen (1967) synonymised three species with *L. humilis*: *L. annulata* (Japan), *Altella nielseni* Schenkel, 1932 (Sweden) and *Altella lathysoides* Denis, 1937 (Algeria). The first two names were removed from synonymy by Ono (2003) and Thaler (1981) respectively.

***Lathys nielseni* (Schenkel, 1932)**
Figs 4-6, 10-12, 17-19, 23-25, 28-32

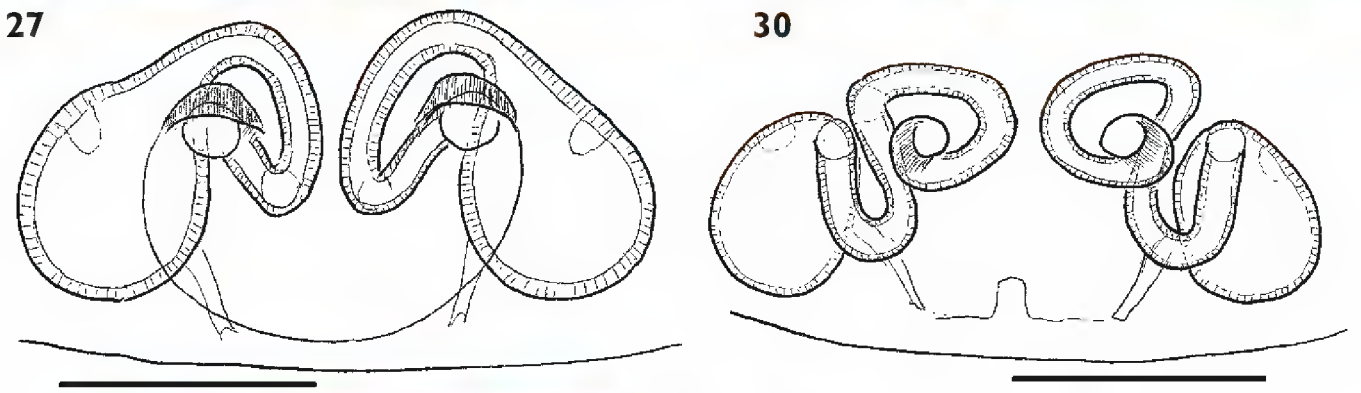
Altella n. Schenkel, 1932: 206, f. 1 (D♀).
L. humilis: Lehtinen 1967: 242, f. 264 (♂). Misidentification
L. bifoveolatus Miller, 1971: 71, pl. IV, f. 3 (D♀).
L. humilis: Palmgren 1977: 22, f. 4.20-24 (♂♀). Misidentification.
L. n.: Thaler 1981: 126, f. 74-76, 80-84 (♂♀).
L. humilis: Hu 1984: 60, f. 55.1-2 (♀). Misidentification, seems to refer to *L. nielseni.*
L. n.: Roberts 1987: 170, f. 88a (♂♀).
L. n.: Heimer and Nentwig 1991: 380, f. 985 (♂♀).
L. n.: Roberts 1995: 88, f. (♂♀).
L. n.: Roberts 1998: 90, f. (♂♀).
L. n.: Almquist 2006: 320, f. 281a-f (♂♀).
L. humilis: Zhu 1985: 58, f. 48a-c (♂). Misidentification, seems to refer to *L. nielseni* or *L. annulata.*
L. humilis: Song et al. 1999: 364, f. 215N (♂). Misidentification, seems to refer to *L. nielseni* or *L. annulata.*
L. humilis: Song et al. 2001: 287, f. 181A-B (♂). Misidentification, seems to refer to *L. nielseni* or *L. annulata.*
Note: some of the references to *L. humilis* may refer to this species.

Material examined. FINLAND: Åland Isl., Geta, Getaberget: 6♂, 27♀, 33 juv. (ZMT/ARA28251), lichenous rocks, 24.05.1975 (P.T. Lehtinen); Humppila, Rantakallio: 1♀ (ZMT), 28.06.1962 (P.T. Lehtinen); Parainen, Mustfinnö: 1♂ (MZT), forest, 4.06.1968 (S. Koponen); same locality: 1♂, 15♀ (ZMT), *Vaccinium*-type forest



Figures 20-25. Epigyne and male chelicera of *Lathys humilis* (**20-22** from Crimea) and *L. nielseni* (**23-25** from Finland) **20**, **23** epigyne, ventral **21**, **24** frontal **22**, **25** inner **20** from Azerbaijan **21-22** – from Crimea. Scale = 0.1 mm.

(P.T. Lehtinen); same locality: 1♂, 25♀ (ZMT), among moss in forest, 14.06.1966 (M. Saaristo); Turku, Kärsämäki, Pomponrahka: 5♀ (ZMT), among *Cladonia*, 29.03.1967 (M. Saaristo); Dragsfjärd, Purunpää: 1♂ (ZMT), 6.06-20.07.1971 (P.T. Lehtinen); Rymättylä, Ruotsalainen: 1♀ (ZMT), 10.07.1971 (P.T. Lehtinen); Nauvo, Seili: 1♀ (ZMT), lichenous rock, 1-30.10.1967 (P. Häkkilä); Somero, Ruunala: 1♂ (ZMT), 1974-1975 (H. Hippa and R. Mannila); Virrat, Patalankylä, Yli-Havankajärvi: 1 juv. (ZMT), 11.07.1972 (P.T. Lehtinen); Turku, Ruissalo: 1♀ (ZMT), 1968 (P.T. Lehtinen); Pori, Yyteri: 1♀ (ZMT), *Elymus* dyne, 14.10. 1961 (P.T. Lehtinen); Tuusula, Ruotsinkylä: 6♂, 15♀, 5 juv. (ZMH), *Calluna*-type forest, 1962-1965 (V. Huhta); Mäntyharju, Hietaniemi, Mäkelä: 2♂, 2♀ (ZMH), *Vaccinium*-type pine forest among *Pleurozium*, 29.05.1966 (P. Palmgren); Hanko, Tvärminne by: 9♂, 4♀, 5 juv. (ZMH), *Calluna*-type pine forest among *Cladonia* and *Hylocomium schreberi*, 1.06.1962 (P. Palmgren); same locality and habitat: 5♀, 16 juv. (ZMH), 8.08.1964 (P. Palmgren); 1♀ (ZMH), Dragsfjärd, Högholmen: among litter in *Myrtillus*-type forest, 5.06.2006 (I. Österblad); 1♀ (ZMH), Hanko, Lappohja, Högsand: 1♀, pitfall-trap, sandy shore, edge of dry pine forest, 19.07-9.08.2004 (N.R. Fritzén); Kuusamo, Rukajärvi, Rukatunturi: 4♀, 15 juv. (ZMT), 10.07.1961 (P.T. Lehtinen). RUSSIA: 2♂, 3♀



Figures 26-32. Epigyne of *Lathys humilis* (**26-27**) and *L. nielseni* (**28-32**) **26**, **28-29** digital photograph of epigyne, ventral **27**, **30** epigyne after maceration, ventral **31-32** epigyne, dorsal **26-27** from Crimea **28**, **30-31** from Finland **29** from Ural **26** after Marusik et al. (2009) **32** after Hu (1984). Scale = 0.1 mm.

(ZMMU), **Bashkortostan**, Ilmenski Reserve, 29.05.1959 and 8.06.1959, (Stebaev). 2♂7♀ [ARAN.SIB 117, MZT] **Novosibirsk** Area, Borovoye, 16.6.1983 (H. Hippa).

Description. Measurements (Finnish specimens). **Male**. Total length 1.8; carapace 0.89 long, 0.69 wide, 0.42 high; chelicerae 0.53 long. Variation (n=3): total length 1.7-1.9; carapace 0.88-0.90 long, 0.68-0.71 wide, 0.39-0.45 high; chelicerae 0.49-0.63 long.

Length of leg segments:

	femur	**patella**	**tibia**	**metatarsus**	**tarsus**	**total**
I	0.81	0.29	0.72	0.63	0.40	2.85
II	0.70	0.27	0.52	0.50	0.35	2.32
III	0.57	0.23	0.37	0.40	0.29	1.87
IV	0.65	0.25	0.50	0.52	0.28	2.20

Female. Total length 1.8; carapace 0.78 long, 0.62 wide, 0.39 high; chelicerae 0.33 long. Variation (n=3): total length 1.6-2.3; carapace 0.75-0.86 long, 0.58-0.65 wide, 0.37-0.40 high; chelicerae 0.26-0.36 long.

Length of leg segments:

	femur	patella	tibia	metatarsus	tarsus	total
I	0.61	0.26	0.47	0.40	0.28	2.01
II	0.53	0.25	0.34	0.34	0.26	1.71
III	0.42	0.24	0.28	0.29	0.21	1.44
IV	0.55	0.23	0.40	0.41	0.23	1.82

Colouration. Carapace in both sexes without distinct pattern, although dark stripes distinguish the cephalic area from the thoracic region. Abdomen with distinct pattern consisting of brownish pigment: long median stripe with transverse arms. Legs without annulations.

Copulatory organs. Male palp (Figs 10-12, 17-19) with patellar apophysis, tibia with three apophyses (retrolateral dorsal, retroventral and retrolateral (or intermediate) that fix (lock) terminal part of conductor. Conductor very long with two arms. Upper arm coiled, lower part spine-like and slightly twisted. Epigyne as in Figs 23, 28-32, with indistinct epigynal fovea and distinct round copulatory openings. Spermathecae egg-shaped. Insemination ducts long with each duct having a vertical and a horizontal loop. First duct turned downwards and then upwards.

Diagnosis. *L. nielseni* can be easily distinguished from *L. humilis* and *L. annulata* by lacking white guanine spots on the abdomen (Figs 4-6). The epigyne of *L. nielseni* resembles that of *L. annulata.* The two species can be separated by the shape of the receptacula (egg-shaped in *L. nielseni* and rounded in *L. annulata*) and the longer insemination ducts in the Japanese species. In addition to colour pattern, males of this species can be separated from the European *L. humilis* by the different shapes of the patellar and tibial apophyses (cf. Figs 13-16 and 17-19), the thinner tip of the conductor and the absence of leg annulations (cf. Figs 1, 4). The females of the two species can be separated by the shape of the fovea (distinct margins and septum in *L. humilis*, no distinct margins and septum in *L. nielseni*), the shape of the spermathecae and the length and the course of the insemination ducts (cf. Figs 20, 23, 26-30).

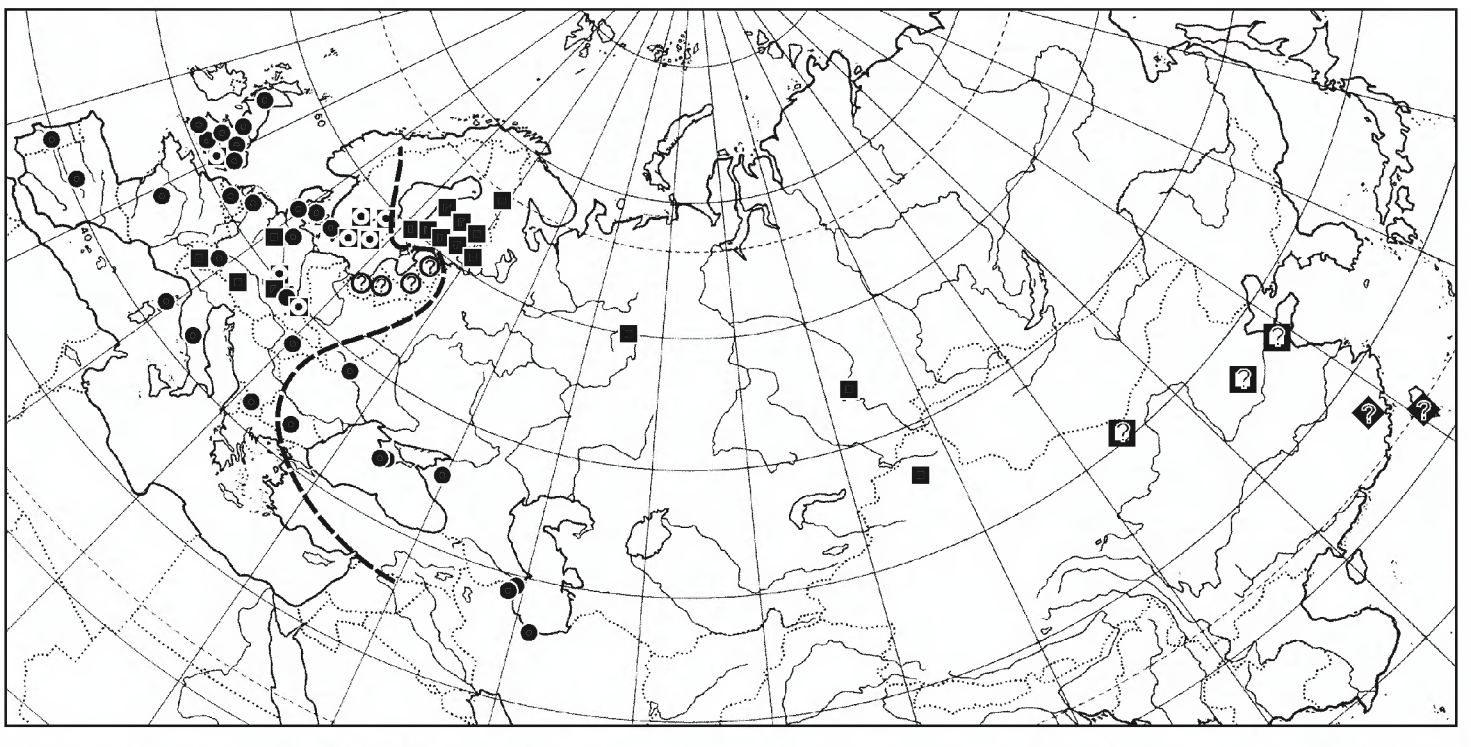
Distribution. It seems that this species has a trans-Palaearctic range and is distributed from the UK to Shandong (China) and possibly to Taiwan. Within Europe, this species has been reported from Austria, Belorus, the Czech Republic, Great Britain, Germany, Slovakia, Sweden and Switzerland (Helsdingen 2007). In addition, *L. nielseni* is also known from the St. Petersburg Area and the southern Urals in Russia. The easternmost proven record of this species lies in the Novosibirsk Area (ca 85°E). The northernmost records are from Finland (where the species is often found up to 63°N) and Kuusamo, 66°10'N (Map 1). A comparison of figures of the epigyne (Figs 31-32) made from Finnish and Shandong specimens (identified by Hu 1984 as *L. humilis*) leaves no doubt that the Chinese specimens belong to *L. nielseni*. Other records from eastern China based on males may also refer either to *L. nielseni* or *L. annulata* (known exclusively from females). The identity of *L. humilis* from Gansu (Schenkel 1936) remains unclear. Figures of the epigyne made by Schenkel are dissimilar to those of both *L. humilis* and *L. nielseni*. The specimen stored in the Swedish Museum of

Natural History, Stockholm, lacks the epigyne and the abdominal pattern is indistinct due to bleaching.

Habitats. Thaler (1981) reported *L. nielseni* from warm pine wood steppe (as high as 1500 m a.s.l.), and Buchar and Růžička (2002) mentioned that it occurs within moss and lichens in pine forests (at 400 m). In England this species occurs in moist places at ground level on heathland, under stones or among damp, dead *Molinia caerulea* litter between the tussocks (Harvey et al. 2002). Almquist (2006) reported the species from dune heaths. In Finland it has been collected mainly from dry habitats, among litter, moss and lichens, also on sand dunes with *Elymus.* It seems that this species occurs only in litter, while the sibling *L. humilis* inhabits bushes and trees, and is found in litter occasionally.

Discussion. The taxonomy of *Lathys* remains poorly and improperly studied in several respects. The limits of this genus are unclear (*Lathys insulana* Ono, 2003 seems to belong to *Argenna* or an undescribed genus; several Nearctic species appear to be distantly related to *L. humilis*). *Scotolathys*, which has long been considered a synonym of *Lathys,* was recently revalidated (Marusik et al. 2009). Many *Lathys* species remain unstudied since their original description, with many species known only from one sex. Many species appear to have been incorrectly synonymised with *L. stigmatisata.* Only a few species have been illustrated adequately.

One of the reasons why the genus has been studied unsatisfactorily is a lack of developed species criteria. For example, in his revision, Lehtinen (1967) paid attention to the tip of the conductor, which is very similar in many species, or the structure of the epigynal fovea (also similar in many distantly related species) (P.T. Lehtinen pers. comm.). The species criteria were poorly defined because the conformation of the male



Map 1. Distribution of *Lathys humilis* (dot) and *L. nielseni* (square). A square and a circle refer to areas where both species have been found. Some dots and two squares (Germany, Switzerland) refer to state records. An open dot and square refer to a questionable record. Diamonds refer to doubtful records of *L. humilis* that may relate either to *L. nielseni* or *L. annulata*. Specimens from localities east of the broken line have been studied by us (except for questionable records).

palp was unknown until recently. The first detailed and correct figures of the *Lathys* male palpal tibia were published by Thaler (1981) and the structure of the bulbus was shown for the first time in 2006 (Marusik et al. 2006).

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References

Almquist S (2006) Swedish Araneae, part 2, families Dictynidae to Salticidae. Insect Systematics and Evolution Suppl. 63: 285-603.

Buchar J, Růžička V (2002) Catalogue of spiders of the Czech Republic. Peres Publishers, Praha, 349 pp.

Chamberlin RV, Gertsch WJ (1958) The spider family Dictynidae in America north of Mexico. Bulletin of the American Museum of Natural History 116: 1-152.

Gertsch WJ (1946) Notes on American spiders of the family Dictynidae. American Museum Novitates 1319: 1-21.

Hänggi A, Stöckli E, Nentwig W (1995) Habitats of Central European spiders. Miscellanea Faunistica Helvetiae 4: 1-460.

Harvey PR, Nellist DR, Telfer MG (Eds) (2002) Provisional atlas of British spiders (Arachnida, Araneae), volume 2. Biological Records Centre, Huntingdon, 215-406.

Heimer S, Nentwig W (1991) Spinnen Mitteleuropas. Paul Parey, Berlin-Hamburg, 543 pp.

Helsdingen PJ van (2007) Fauna Europaea: Araneae. Fauna Europaea version 1.3, http://www.faunaeur.org [accessed 10.02.2009]

Hu JL (1984) The Chinese spiders collected from the fields and the forests. Tianjin Press of Science and Techniques, 482 pp. [in Chinese]

Koponen S (2008) Checklist of spiders in Finland (Araneae), 4th version, December 2008. http://users.utu.fi/sepkopo/checklist_of_spiders_in_Finland.htm [accessed 10.02.2009]

Ledoux J-C, Braud S, Duffey E, Chéreau L (2008) *Lathys sexpustulata* Simon 1878 = *Lathys alticola* (Denis, 1954). Revue arachnologique 17: 59-60.

Lehtinen PT (1967) Classification of the Cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. Annales Zoologici Fennici 4: 199-468.

Marusik YM, Ovchinnikov SV, Koponen S (2006) Uncommon conformation of the male palp in common Holarctic spiders belonging to the *Lathys stigmatisata* group (Araneae, Dictynidae). Bulletin of the British Arachnological Society 13 (9): 353-360.

Marusik YM, Kovblyuk MM, Nadolny AA (2009) A survey of *Lathys* Simon, 1884 from Crimea with resurrection of *Scotolathys* Simon, 1884 (Aranei: Dictynidae). Arthropoda Selecta 18 (1/2): 21-33.

Menge A (1869) Preussische Spinnen. III. Abtheilung. A.W. Kafemann, Danzig, 219-264.

Miller F (1971) Řád Pavouci - Araneida. In Daniel M, Černy V (Eds) Klíč zvířeny ČSSR, ČSAV Praha 4: 51-306. [in Czech]

Ono H (2003) A new dictynid spider from Iriomotejima Island, southwest Japan, with a list of Japanese species of the genera *Lathys* and *Brommella* (Arachnida, Araneae). Bulletin of the National Science Museum Tokyo (Ser. A) 29: 7-13.

Paik KY (1978) Araneae. Illustrated Flora & Fauna of Korea 21: 1-548.

Palmgren P (1977) Die Spinnenfauna Finnlands und Ostfennoskandiens VIII. Fauna Fennica 30: 1-34.

Platnick NI (2009) The world spider catalog, version 9.5. American Museum of Natural History, http://research.amnh.org/entomology/spiders/catalog/index.html [accessed 10.02.2009]

Roberts MJ (1987) The spiders of Great Britain and Ireland, vol. 2. Harley Books, Colchester, 204 pp.

Roberts MJ (1995) Collins Field Guide: Spiders of Britain and Northern Europe. Harper Collins, London, 383 pp.

Roberts MJ (1998) Spinnengids. Tirion, Baarn, Netherlands, 397 pp.

Schenkel E (1932) Verzeichnis der von E. Nielsen auf Öland und Småland gesammelten Spinnen. Entomologisk Tidskrift 53: 202-209.

Schenkel E (1936) Schwedisch-chinesische wissenschaftliche Expedition nach den nordwestlichen Provinzen Chinas, unter Leitung von Dr Sven Hedin und Prof. Sü Ping-chang. Araneae gesammelt vom schwedischen Artz der Exped. Arkiv för Zoologi 29 (A1): 1-314.

Simon E (1884) Les arachnides de France. Paris, 5: 180-885.

Song D, Zhu M, Chen J (1999) The Spiders of China. Hebei Science and Technology Publishing House, Shijiazhuang, 640 pp.

Song D, Zhu M, Chen J (2001) The Fauna of Hebei, China: Araneae. Hebei Science and Technology Publishing House, Shijiazhuang, 510 pp.

Thaler K (1981) Bemerkenswerte Spinnenfunde in Nordtirol (Österreich). Veröffentlichungen des Museum Ferdinandeum (Innsbruck) 61: 105-150.

Wiehle H (1953) Spinnentiere oder Arachnoidea (Araneae), IX: Orthognatha – Cribellatae – Haplogynae - Entelegynae. Die Tierwelt Deutschlands und der angrenzenden Meeresteile 42: 1-150.

Zhu MS (Ed.) (1985) Crop field spiders of Shanxi Province. Agriculture Planning Committee of Shanxi Province, 239 pp.